

## N O T I C E

THIS DOCUMENT HAS BEEN REPRODUCED FROM  
MICROFICHE. ALTHOUGH IT IS RECOGNIZED THAT  
CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED  
IN THE INTEREST OF MAKING AVAILABLE AS MUCH  
INFORMATION AS POSSIBLE

~~LACIE PHASE COPY~~

JSC-11835 80-10222  
NASA CR-

160613

PDP 11/45 LACIE PHASE II/III  
AUTOMATIC STATUS AND TRACKING SYSTEM  
FUNCTIONAL DESIGN SPECIFICATION

Job Order 71-695

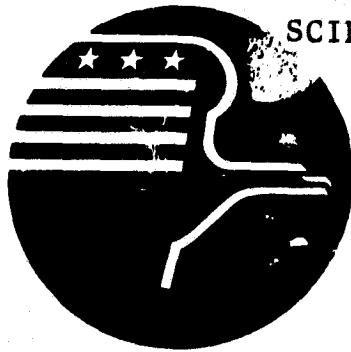
(TIRF 76-0085)

(E80-10222) PDP 11/45 LACIE PHASE 11/111  
AUTOMATIC STATUS AND TRACKING SYSTEM  
FUNCTIONAL DESIGN SPECIFICATION (Lockheed  
Electronics Co.) 53 p HC A04/MF A01

N80-27772

Unclassified  
CSCL 02C G3/43 00222

Prepared By  
Lockheed Electronics Company, Inc.  
Aerospace Systems Division  
Houston, Texas  
Contract NAS 9-12200  
For  
EARTH OBSERVATIONS DIVISION  
SCIENCE AND APPLICATIONS DIRECTORATE



*National Aeronautics and Space Administration*  
**LYNDON B. JOHNSON SPACE CENTER**

*Houston, Texas*

November 1976

LEC-9861

JSC-11835

PDP 11/45 LACIE PHASE II/III  
AUTOMATIC STATUS AND TRACKING SYSTEM  
FUNCTIONAL DESIGN SPECIFICATION

Job Order 71-695

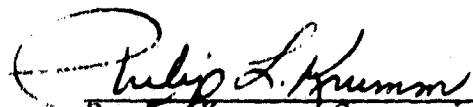
(TIRF 76-0085)

PREPARED BY

J. M. Everette  
D. L. Smith

APPROVED BY

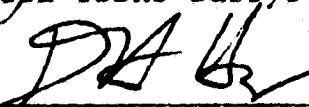
LEC

  
Philip L. Krumm  
P. L. Krumm, Supervisor  
Software Development Section

NASA

  
V. M. Dauphin  
V. M. Dauphin, Data Manager  
Earth Observations Division

  
J. M. Sulester  
LACIE ISSRS Subsystem Manager

  
D. H. Hay  
D. H. Hay, Chief  
Systems and Facilities Branch

Prepared By  
Lockheed Electronics Company, Inc.  
For  
Earth Observations Division  
Science and Applications Directorate

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION  
LYNDON B. JOHNSON SPACE CENTER  
HOUSTON, TEXAS

November 1976

LEC- 9861

## LIST OF ABBREVIATIONS

ASATS	Automatic Status and Tracking System
DAPTS	A subset of the ASATS data base which contains segment descriptions.
EOF	End-of-file
FLOCON	A subset of the ASATS data base which contains acquisition descriptions, and history.
F4P	The FORTRAN-IV-Plus compiler.
ID	Identification.
LACIE	Large Area Crop Inventory Experiment.
RECID	Record identification field in RIMS data base records.
RIMS	Regional Information Management System.
TIRF	Transmittal/Information Request Form.

## CONTENTS

Section	Page
1. INTRODUCTION . . . . .	1-1
1.1 <u>PURPOSE AND SCOPE</u> . . . . .	1-1
1.2 <u>BACKGROUND</u> . . . . .	1-2
1.3 <u>SYSTEM DESCRIPTION</u> . . . . .	1-3
2. APPLICABLE DOCUMENTS . . . . .	2-1
3. DESIGN. . . . .	3-1
3.1 <u>GENERAL</u> . . . . .	3-1
3.1.1 STANDARD UPDATE PROCESSING . . . . .	3-1
3.1.2 STANDARD REPORT GENERATION . . . . .	3-1
3.1.3 AD HOC QUERY AND UPDATE . . . . .	3-1
3.1.4 DATA BASE INTEGRITY. . . . .	3-5
3.1.4.1 <u>Checkpoint - Restart Data Base Recovery</u> . . . . .	3-5
3.1.4.2 <u>Access Control.</u> . . . . .	3-8
3.2 <u>DATA BASE DESIGN</u> . . . . .	3-10
3.3 <u>RIMS MODIFICATIONS.</u> . . . . .	3-13
3.3.1 ASATS STANDARD DATA BASE UPDATES . . .	3-14
3.3.1.1 <u>Special Update Command</u> . . . . .	3-14
3.3.1.2 <u>Use of Input Formats.</u> . . . . .	3-23
3.3.2 SPECIAL COMMANDS FOR ANNOTATING REPORTS	3-24
3.3.2.1 <u>Header Command.</u> . . . . .	3-24
3.3.2.2 <u>Count Command</u> . . . . .	3-25

Section	Page
3.3.3 SOFTWARE TO ELIMINATE REDUNDANT STORAGE. . . . .	3-25
3.3.3.1 <u>Generate Parent Set</u> . . . . .	3-25
3.3.3.2 <u>Generate Children Set</u> . . . . .	3-25
3.3.3.3 <u>Display Data from Two Data Base Levels</u> . . . . .	3-26
3.3.4 ACCESS CONTROL . . . . .	3-27
3.3.4.1 <u>Add Access Control Word</u> . . . . .	3-27
3.3.4.2 <u>Delete Access Control Word</u> . . . . .	3-27
3.3.4.3 <u>Modifications to "Begin" Operation for Access Control</u> . . . . .	3-27
3.3.4.4 <u>Modification to RIMS Control Routine for Access Control</u> . . . . .	3-28
3.3.5 ARITHMETIC OPERATIONS . . . . .	3-28
3.3.5.1 <u>Compute Command</u> . . . . .	3-28
3.3.6 MODIFICATION TO EXISTING COMMANDS . . . . .	3-30
3.3.6.1 <u>Modification to Reassign File</u> . . . . .	3-30
3.3.6.2 <u>Null Set Option</u> . . . . .	3-30
3.3.6.3 <u>Changes to Other Routines for Null Sets</u> . . . . .	3-31
3.4 THE PREPROCESSOR . . . . .	3-32
3.4.1 PURPOSE. . . . .	3-32
3.4.2 INPUT . . . . .	3-32
3.4.3 OUTPUT . . . . .	3-32
3.4.4 DESCRIPTION OF PROCESS. . . . .	3-33
3.5 THE POSTPROCESSOR . . . . .	3-35
3.5.1 PURPOSE. . . . .	3-35

<b>Section</b>		<b>Page</b>
3.5.2	INPUT . . . . .	3-35
3.5.3	OUTPUT . . . . .	3-35
3.5.4	PROCESS. . . . .	3-36
3.6	<u>ASATS STANDARD REPORTS</u> . . . . .	3-38
4.	TEST PLAN. . . . .	4-1
5.	TRAINING PLANS . . . . .	5-1

## TABLES

Table	Page
3-1 DAPTS RECORD FORMAT . . . . .	3-11
3-2 FLOCON RECORD FORMAT. . . . .	3-12
3-3 INPUT TRANSLATION FOR GENERATING SEGMENT STATUS CHARACTER . . . . .	3-19
3-4 SPECIAL UPDATE DESCRIPTION. . . . .	3-20
3-5 USE OF DATA TYPES ON INPUT. . . . .	3-22

## FIGURES

Figure	Page
3-1 AUTOMATIC STATUS AND TRACKING SYSTEM - OVERALL VIEW. . . . .	3-2
3-2 AUTOMATIC STATUS AND TRACKING SYSTEM - STANDARD UPDATE PROCESSOR SUBSYSTEM . . . .	3-3
3-3 AUTOMATIC STATUS AND TRACKING SYSTEM - REPORT GENERATION SUBSYSTEM. . . . .	3-4
3-4 AUTOMATIC STATUS AND TRACKING SYSTEM - AD HOC QUERY AND REPORT SUBSYSTEM. . . . .	3-6
3-5 ASATS - CHECKPOINT - RECOVERY PROCESS . . . .	3-7
3-6 ASATS - ACCESS CONTROL IN AD-HOC REPORT GENERATION . . . . .	3-9
3-7 SPECIAL UPDATE PROCESSOR FLOW . . . . .	3-16
3-8 THE PREPROCESSOR . . . . .	3-34
3-9 ASATS - THE POSTPROCESSOR . . . . .	3-37

## 1. INTRODUCTION

### 1.1 PURPOSE AND SCOPE

This document describes the functional design characteristics of the PDP 11/45 LACIE Phase II/III Status and Tracking System. This System will provide mechanisms to support the management of LACIE imagery processing and associated evaluation material. For each package of such material, the System will maintain a record containing the history and the present status and location of the package as that package follows its track from one LACIE processing station to another. The System will provide means for generating reports on status information and on statistical data about the flow of material through the LACIE stations.

The ASATS design is based upon achieving maximum use of the Regional Information Management System (RIMS) to perform ASATS functions. The functional design is described in terms of (1) data base design, (2) new RIMS software built to simplify implementation of ASATS, (3) software designed for ASATS which runs independantly of RIMS, and (4) a method for constructing standard ASATS reports.

This document also describes plans for testing and operation of the System.

## 1.2 BACKGROUND

A version of the ASATS is currently operational on the COMSHARE's computer system. It was developed using the COMPOSIT 77 data management system. In order to reduce the cost of operating ASATS, it is being implemented on the PDP 11/45.

In order that the transition from one computer system to another cause minimal impact, the standard update procedures (including update card formats) and standard reports must be as nearly identical as possible. Because a different data management system is used for the PDP 11/45 and COMSHARE version, the ad hoc query and update processes will be different. But the PDP 11/45 version will provide similar capabilities for ad hoc query and update. Implementation of the PDP 11/45 version is based upon the same requirement document (LbC-8675) that was previously used for implementing the COMSHARE version of ASATS.

### **1.3 SYSTEM DESCRIPTION**

ASATS will operate on the PDP 11/45 using the Regional Information System (RIMS). It will use the RSX 11-D Version 6.01 operating system. ASATS System hardware requirements include:

- PDP 11/45 with a minimum of 64K of storage (32K for RSX and 32K for RIMS and ASATS)
- Disk storage (size requirement depends upon the number of data base records)
- TTY compatible terminal for interactive work
- Card reader for standard update and reports
- Printer
- Card punch (requirement may be satisfied by off line capability)
- Two magnetic tape units

ASATS software requirements include:

- RSX-11D version 6.01 operating system
- FORTRAN IV-Plus (F4P) compiler for software maintenance
- Regional Information Management System (RIMS)

The ASATS software will be composed of (1) special processors built for ASATS to facilitate the auditing of ASATS data base updates, (2) RIMS commands augmented to support specific ASATS requirements and (3) command files (sequences of RIMS commands) which will cause the generation of specified reports, (4) data base definitions describing the ASATS data base to RIMS and (5) format descriptions describing input files and report formats.

## 2. APPLICABLE DOCUMENTS

The following documents are applicable:

- Large Area Crop Inventory Experiment (LACIE) Phase III Automatic Status and Tracking System Specifications dated August 1976 (document LEC-8675, JSC-11401)
- RIMS Design Document
- RIMS Maintenance Document
- RIMS User Document, dated August 16, 1976
- TIRF No. 76-0085

## 3. DESIGN

### 3.1 GENERAL

An overall picture of the PDP 11/45 Status and Tracking System is shown in Figure 3-1. The arrows in the diagram indicate flow of information.

Figures 3-2 through 3-6 show the System in more detail and illustrate the data paths which satisfy the major requirements specified for the System as described in the following sections.

#### 3.1.1 STANDARD UPDATE PROCESSING

Handling of standard batch mode daily update cards is shown in Figure 3-2. The Preprocessor is a set of operations specially designed for the ASATS update card formats. The Preprocessor produces some of the required audit listings of the input cards and rearranges the input for proper processing by RIMS. RIMS makes the required updates to the data base and produces a file of information concerning all attempted updates. A postprocessor uses that information to produce the rest of the required reports on attempted updates and to punch the cards required by certain updates.

#### 3.1.2 STANDARD REPORT GENERATION

Batch mode production of standard System reports is illustrated in Figure 3-3. For each of the standard reports there will be a "canned" stream of RIMS commands to collect the information required for the report and put it into proper order. Selection of different reports as desired is made by different cards in the batch input control of RIMS.

#### 3.1.3 AD HOC QUERY AND UPDATE

The generalized data management capability of RIMS can be used

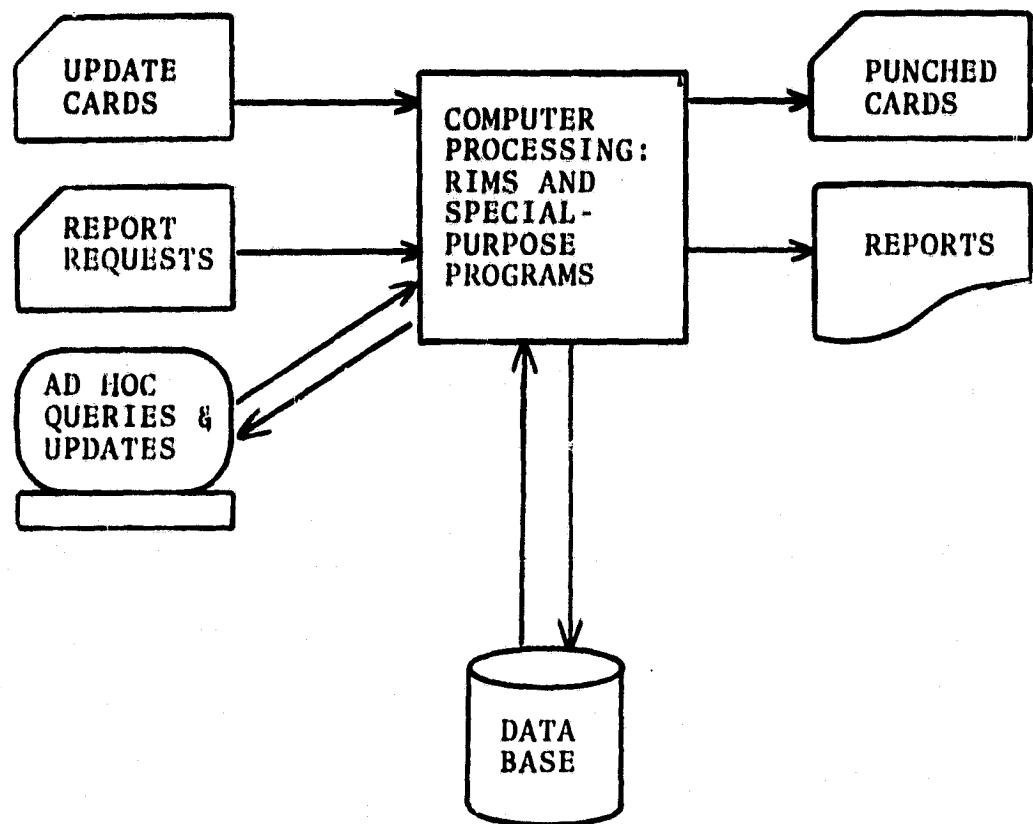


FIGURE 3-1  
AUTOMATIC STATUS AND TRACKING SYSTEM - OVERALL VIEW

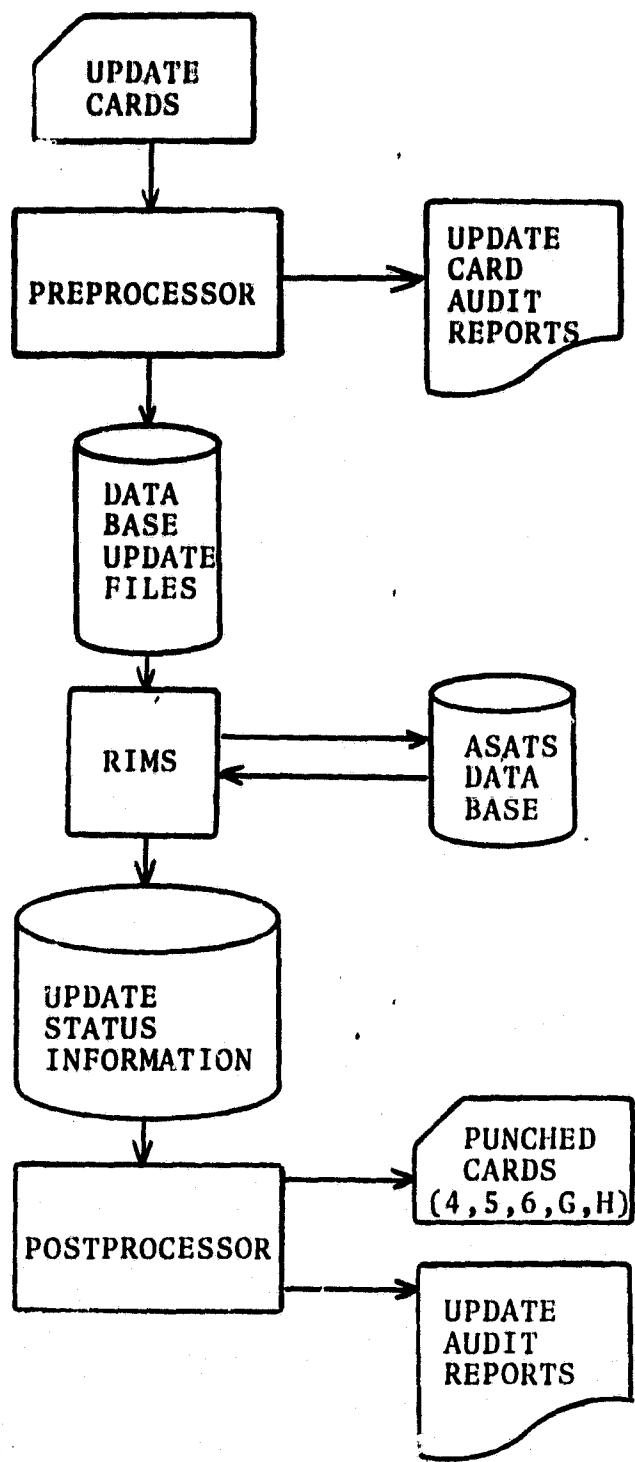


FIGURE 3-2  
AUTOMATIC STATUS AND TRACKING SYSTEM -  
STANDARD UPDATE PROCESSOR SUBSYSTEM

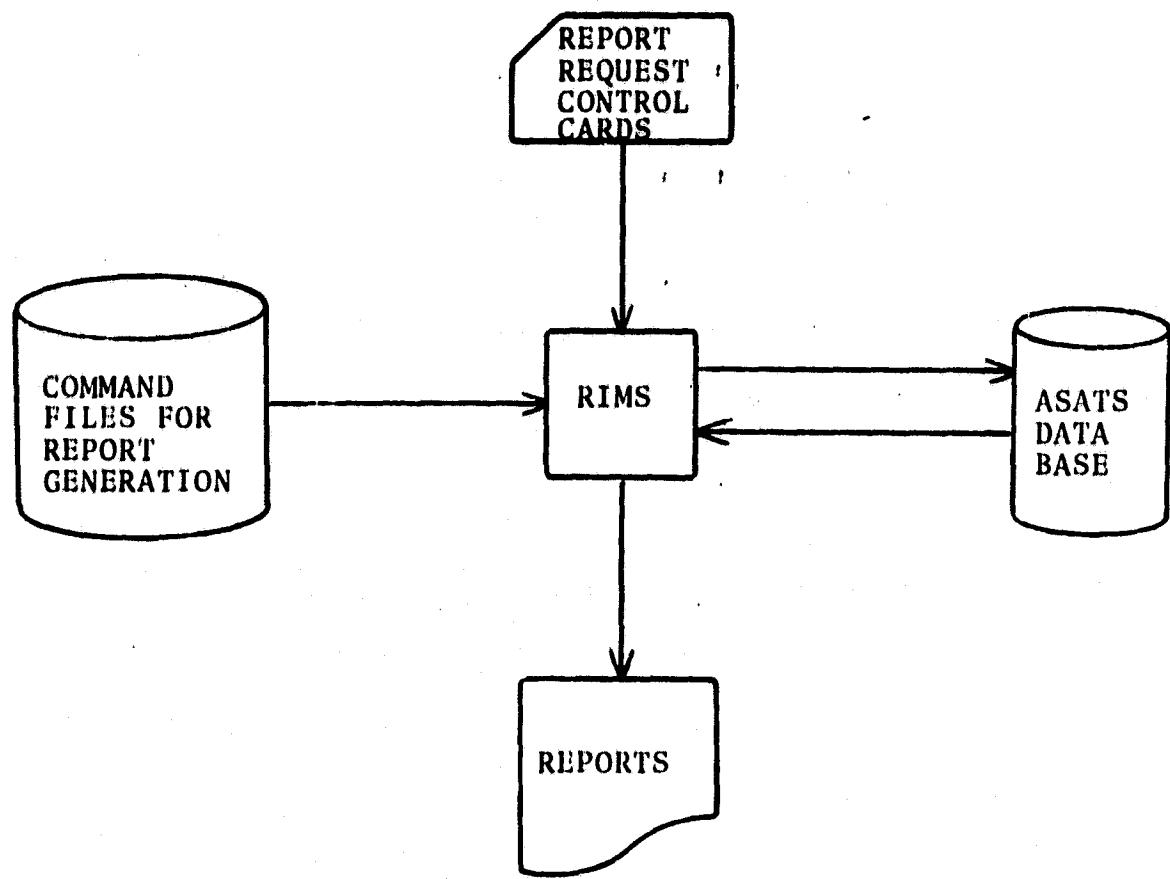


FIGURE 3-3  
AUTOMATIC STATUS AND TRACKING SYSTEM -  
REPORT GENERATION SUBSYSTEM

for several different purposes, as shown in Figure 3-4. Demand production of one-of-a-kind reports can be done through an interactive terminal or in batch mode controlled by cards. In either batch or interactive mode, RIMS can read a command stream or data file brought in from tape or produced by other processes. Information extracted by RIMS from the data base can be printed as a report or displayed at the interactive terminal or it can be used as input for other programs which might perform special analysis beyond the capabilities of RIMS itself. Some of the data flow paths shown in Figure 3-4 may be restricted for some users, as will be described in section 3.1.4.2.

### 3.1.4 DATA BASE INTEGRITY

#### 3.1.4.1 Checkpoint - Restart Data Base Recovery

In spite of all economically feasible controls over hardware, software and procedures, the data base is vulnerable to damage or total destruction from such causes as computer system malfunction, flaws in physical storage media, or accidental running of improper updates. Figure 3-5 illustrates procedures which will minimize the time and effort required to put the data base back in its proper form after being damaged.

As shown, the data base will be dumped to magnetic tape periodically (once per day, after making all of the day's updates, is suggested; the time interval can be adjusted after gaining some experience with failure frequency for this system). These "checkpoint" dumps on tape will be stored off-line, while the active data base is altered by batch and interactive updates on following days. If the active data base is damaged or lost, a checkpoint dumped tape (the most recent one dumped before the failure) will be read back to on-line storage, which restores a previous day's active data base. That restored

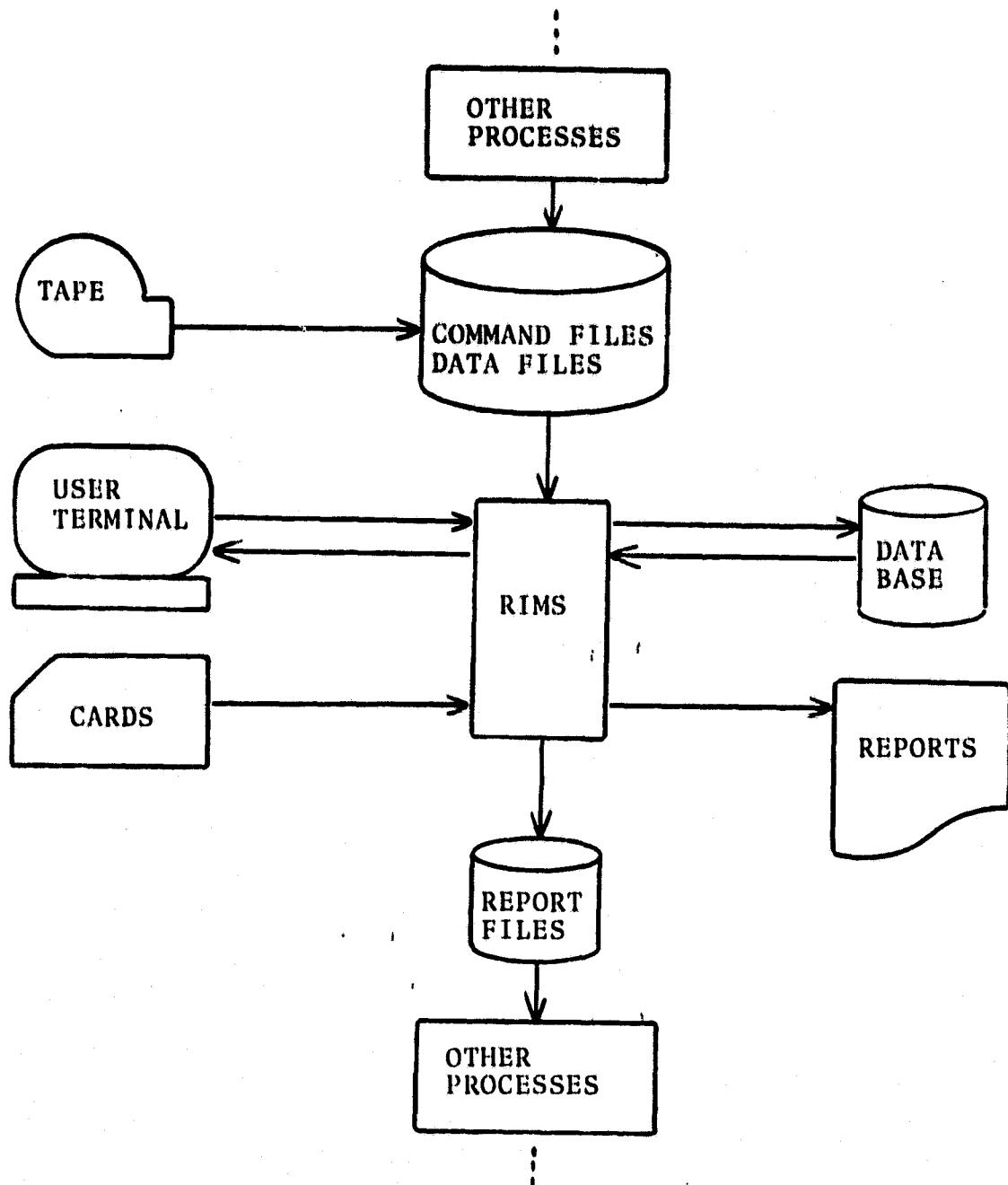


FIGURE 3-4  
AUTOMATIC STATUS AND TRACKING SYSTEM -  
AD HOC QUERY AND REPORT SUBSYSTEM

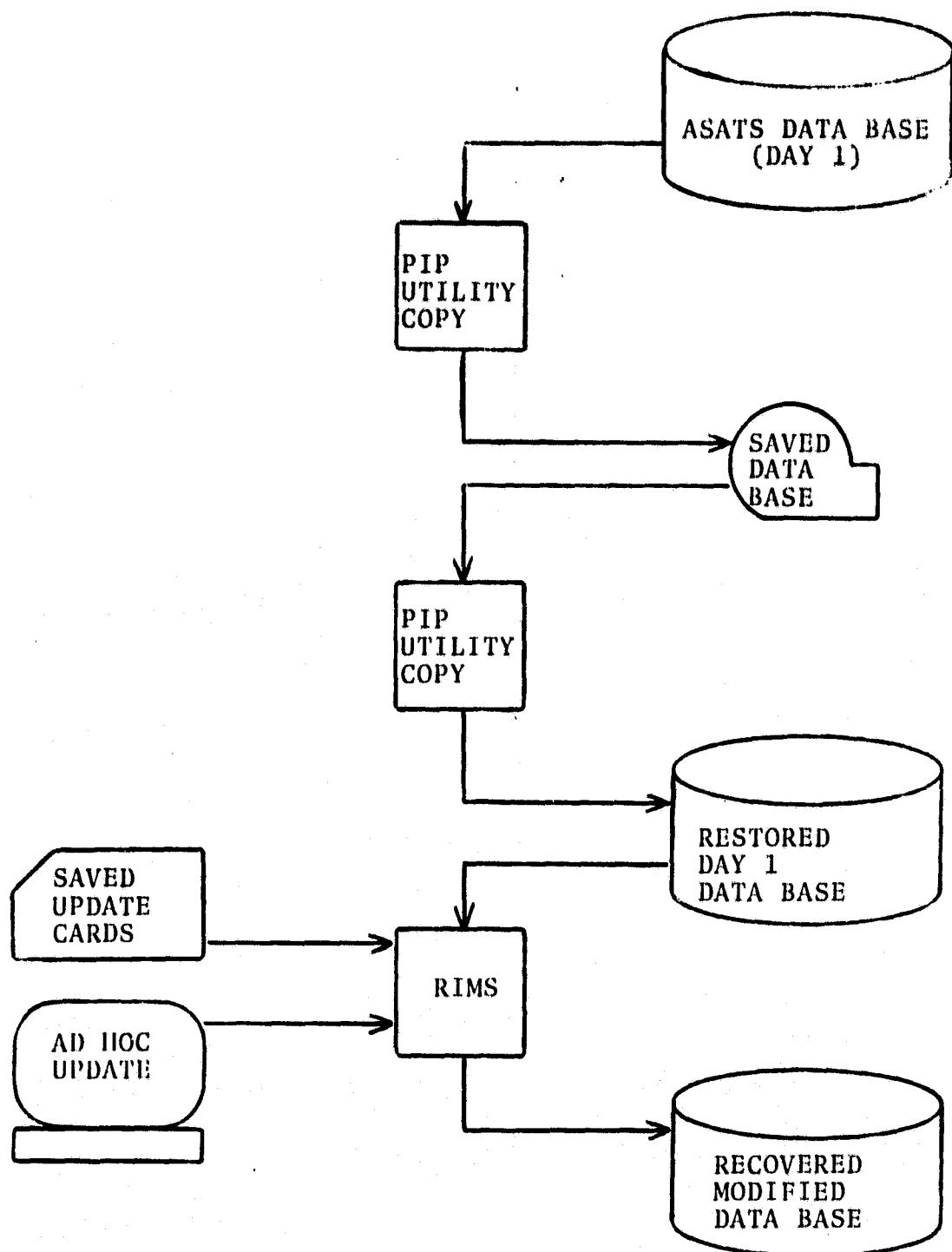


FIGURE 3-5  
ASATS - CHECKPOINT - RECOVERY PROCESS

data base must then be modified by any batch-mode card updates and any ad-hoc updates which have been made since the time the checkpoint dump was taken. Making those updates will bring the active data base to the condition it should have had if no failure had occurred.

#### 3.1.4.2 Access Control

Accidental or malicious damage to the data base will be minimized by controls which allow data base modifications to be made only by authorized personnel. Some users may produce reports without having permission to alter the data base. For these users, controls built into the RIMS software will restrict data flow to the paths shown in Figure 3-6. As shown, the permanent files of the active data base can be read by a restricted user, but not written. Writing of temporary files required to collect information for report production will still be allowed. A password system will be used to identify users with unrestricted read-write access to the entire data base.

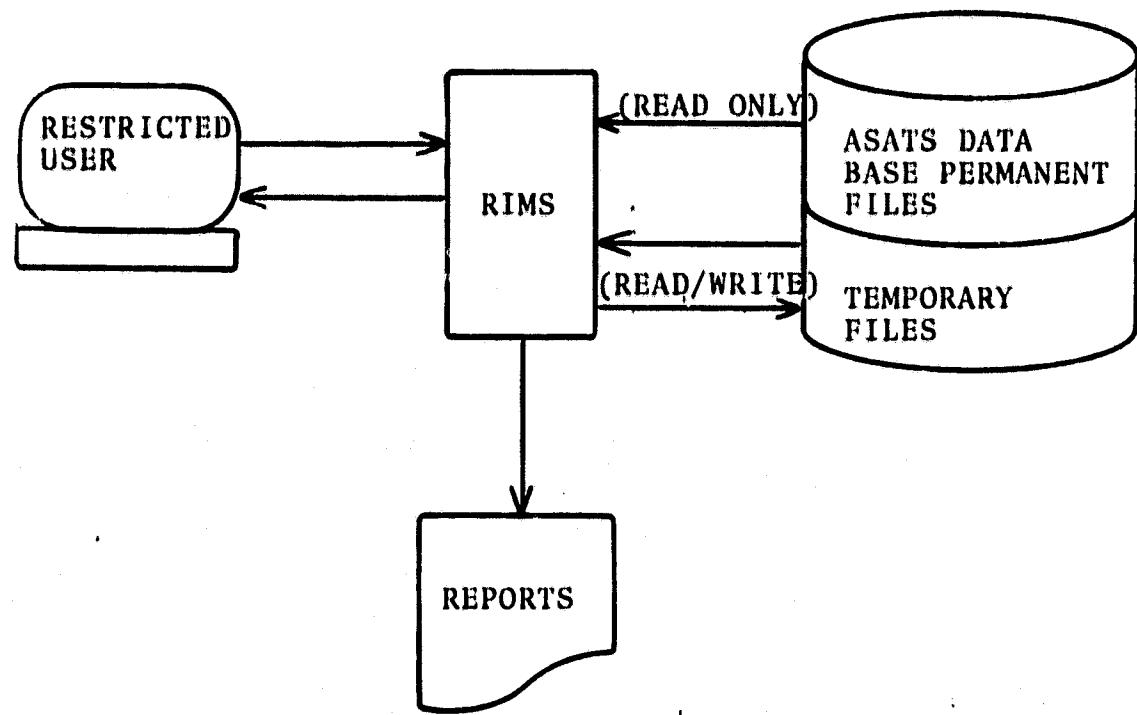


FIGURE 3-6  
ASATS - ACCESS CONTROL IN AD-HOC REPORT GENERATION

### 3.2 DATA BASE DESIGN

The data base for ASATS contains two primary kinds of data records. Each DAPTS record contains information about a segment that is pertinent to all acquisitions for that segment. The fields of the DAPTS records are described in Table 3-1. Each FLOCON record contains information about one particular acquisition and the processing of acquisition material packages by the LACIE work stations. The FLOCON records are described in Table 3-2.

The system will maintain two physically separate data bases, one for LACIE Phase II and one for LACIE Phase III. Each data base will contain both DAPTS and FLOCON records. In addition, RIMS uses the data base to store information about the data base: format records (as described in RIMS documentation) for data records and for input and output records.

TABLE 3-1.-DAPTS RECORD FORMAT

Field Name	Description	Length (Char)	Start (Char)	End (Char)	Key	Source Card
SEG	segment number	4	1	4	X	*
LPI	LACIE phase indicator	1	5	5		*
COUNTRY	country designator	6	6	11	X	*
REG	region	4	12	15		*
ZONE	zone	4	16	19		*
STR	stratum	4	20	23		*
GD	global designator	1	24	24		*
WV	wheat variety	1	25	25	X	2
PC	priority code	2	26	27	X	*
TY	segment type	1	28	28		2
BIOW10	biowindow 1 open (start date)	4	29	32		3
BIOW1C	biowindow 1 close (end date)	4	33	36		3
BIOW20	biowindow 2 open	4	37	40		3
BIOW2C	biowindow 2 close	4	41	44		3
BIOW30	biowindow 3 open	4	45	48		3
BIOW3C	biowindow 3 close	4	49	52		3
BIOW40	biowindow 4 open	4	53	56		3
BIOW4C	biowindow 4 close	4	57	60		3
TOPO	date topo map received	4	61	64		4
CROP	date crop calendar received	4	65	68		5
ANCIL	date ancillary data received	4	69	72		6
SSC	segment status character	1	73	73		4,5,6
LSD	time of last change to this record	6	74	79		(last update)

TABLE 3-2.-FLOCON RECORD FORMAT

Field Name	Description	Length (Char)	Start (Char)	End (Char)	Key	Source Card
SEG	segment number	4	1	4	X	B
LPI	LACIE phase indicator	1	5	5		B
DATAcq	acquisition date	4	6	9	X	B
BW	biowindow	1	10	10	X	B
FF	film flag	1	11	11		B
CURS	current station/status	1	12	12		(last)
CURCOM	current comment	20	13	32		(last)
TAPE	GSFC tape number	6	33	38		B
GSFC	GSFC processing date	4	39	42		B
CANI	C&I update date	4	43	46		B
LPDLCOMP	date film products received from LPDL	4	47	50		G
AICOMP	date segment ready for CAMS pickup	4	51	54		H
PACKREC	date packet received by CAMS	4	55	58		I
RUNSUB	date FDB/batch data processing request submitted	4	59	62		J
RUNCT	run count	4	63	66		(J)
PRODREC	date batch products received by CAMS	4	67	70		K
REWORK	date rework begun	4	71	74		M
RWKCT	rework count	4	75	78		(M)
TOCAS	date to CAS	4	79	82		X
CAMSBP	CAMS biophase	3	83	85		X
CATG	CAMS evaluation category	2	86	87		X
LSD	time of last change to this record	6	88	93		(last update)

### **3.3 RIMS MODIFICATIONS**

This section identifies the new commands which are being implemented as part of RIMS to support ASATS. These commands are catagorized as follows:

- a. Special Update Command - This command was defined because of the requirement to implement ASATS on the PDP 11/45 with no changes of input from the form for ASATS on COMSHARE using Composit 77. The command will process all standard ASATS input cards.
- b. Commands to Support Elimination of Redundant Data - The data base for ASATS has a hierarchical relationship between DAPTS records and FLOCON records. Commands to create a set of related FLOCON records for DAPTS and to create a set of related DAPTS records for FLOCON records will be provided. Also, a command for displaying records containing data from both a FLOCON record and a DAPTS record will be provided.
- c. Access Control Command - A command for delivering and specifying access control will be provided. Also, the system will include a modification to require a user to identify himself with his access control word at the beginning of a session.
- d. Computation Command - This command will allow the user to sum fields, field differences, compute mean, and compute standard deviations for a set of records.
- e. Header Control Commands - Commands will be provided to allow the user to specify report headers in a simpler manner and to provide textual description for the number of entries in a set.

### 3.3.1 ASATS STANDARD DATA BASE UPDATES

This section describes design for ASATS data base update. It includes a description of an update command built specifically for ASATS. It also describes the use of input formats for specifying processing for individual record types.

#### 3.3.1.1 Special Update Command

**Purpose:** Updates data base from set of input cards. Specific update operations are a function of card type (specified in second character of each card), data base format, and the input format. The input format and the data base to be used are a function of the card type and LACIE phase.

##### Inputs:

- **Command:** Processing is begun by a UP command
- **Status and tracking input cards:** Any of the 19 types of ASATS update cards are processed sequentially until an EOF (except the Q card, which is handled by the Preprocessor).
- **EOF:** Processing of an input file is ended by an O card type (inserted by the Preprocessor).

**Outputs:** Besides updating the ASATS data base, the following information is recorded sequentially on a file:

- **Rejected input cards**
- **Required DAPTS record does not exist (for \*, 2, 3, 4, 5, and 6 cards)**
- **Required FLOCON record does not exist**
- **FLOCON record has not reached required state for particular type of card.**
- **Accepted input cards which created new DAPTS records.**

**Processing:** The required processing is a function of card type. Card types are categorized as follows:

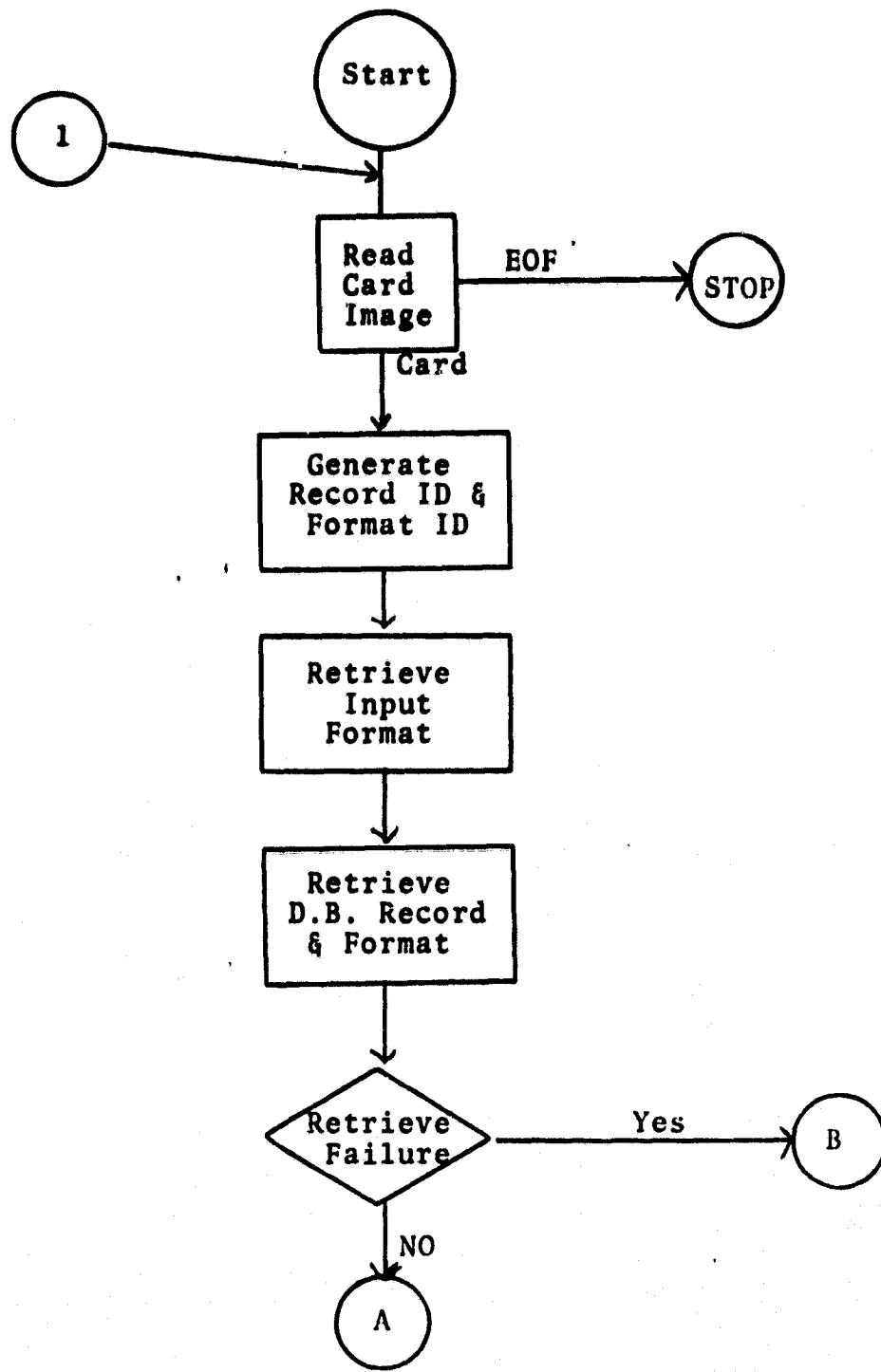
- Category 1 - card types 1, 2, 3 (in sets)
- Category 2 - card types 1, 2, 4, 5 and 6
- Category 3 - card type 3
- Category 4 - card type 8
- Category 5 - other card types

A generalized function for adding new records and updating existing records will exist. This function, which is driven by input formats, data base formats, and card type, will add or modify the specified record. The general steps of processing input cards are:

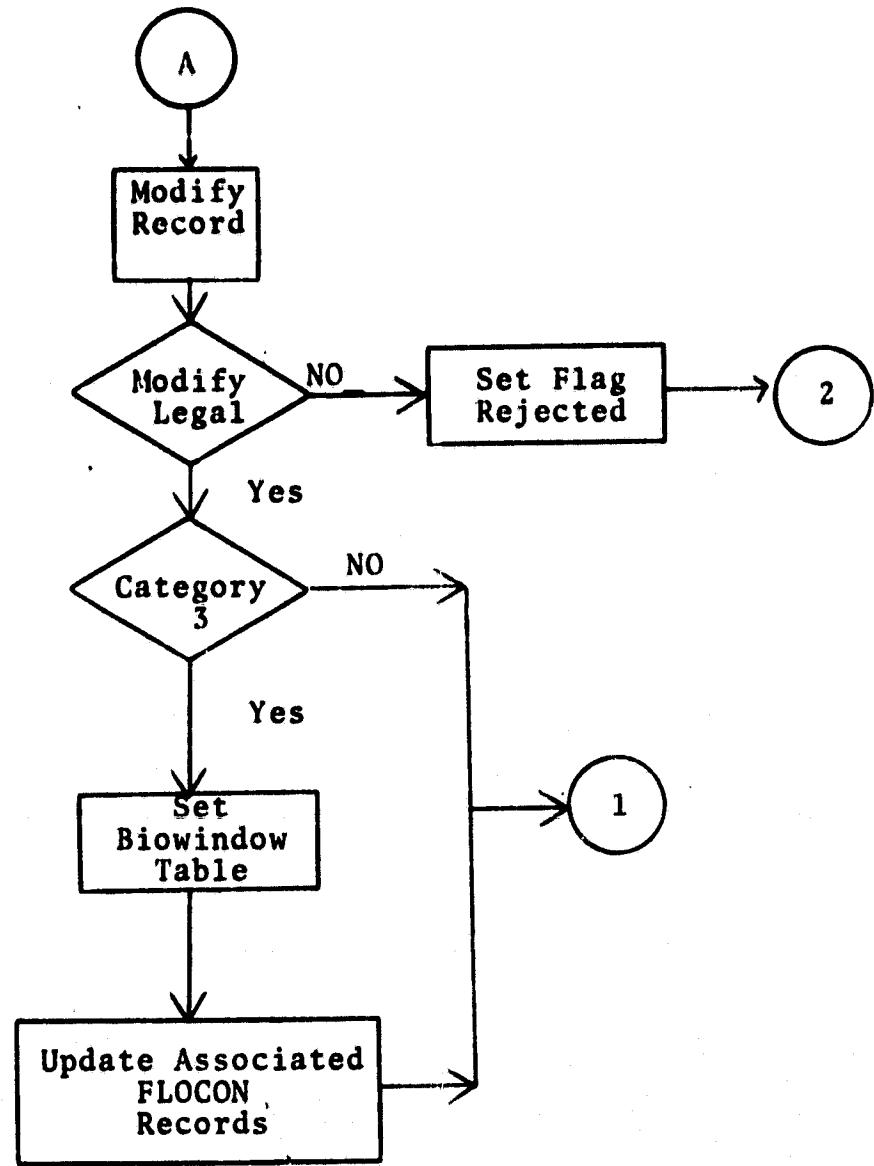
- Read input card
- Generate record ID
- Generate external (input) format ID from table
- Retrieve record
- Retrieve formats
- Either add or update record
- Output card image reflecting success or error

Figure 3-7 depicts the flow of this process and variations dependent upon category of card type.

Table 3-4 indicates the data used for generating a record depending on input category. The input format is a function of the card type. Table 3-4 also indicates the action to be taken upon a record retrieval failure.

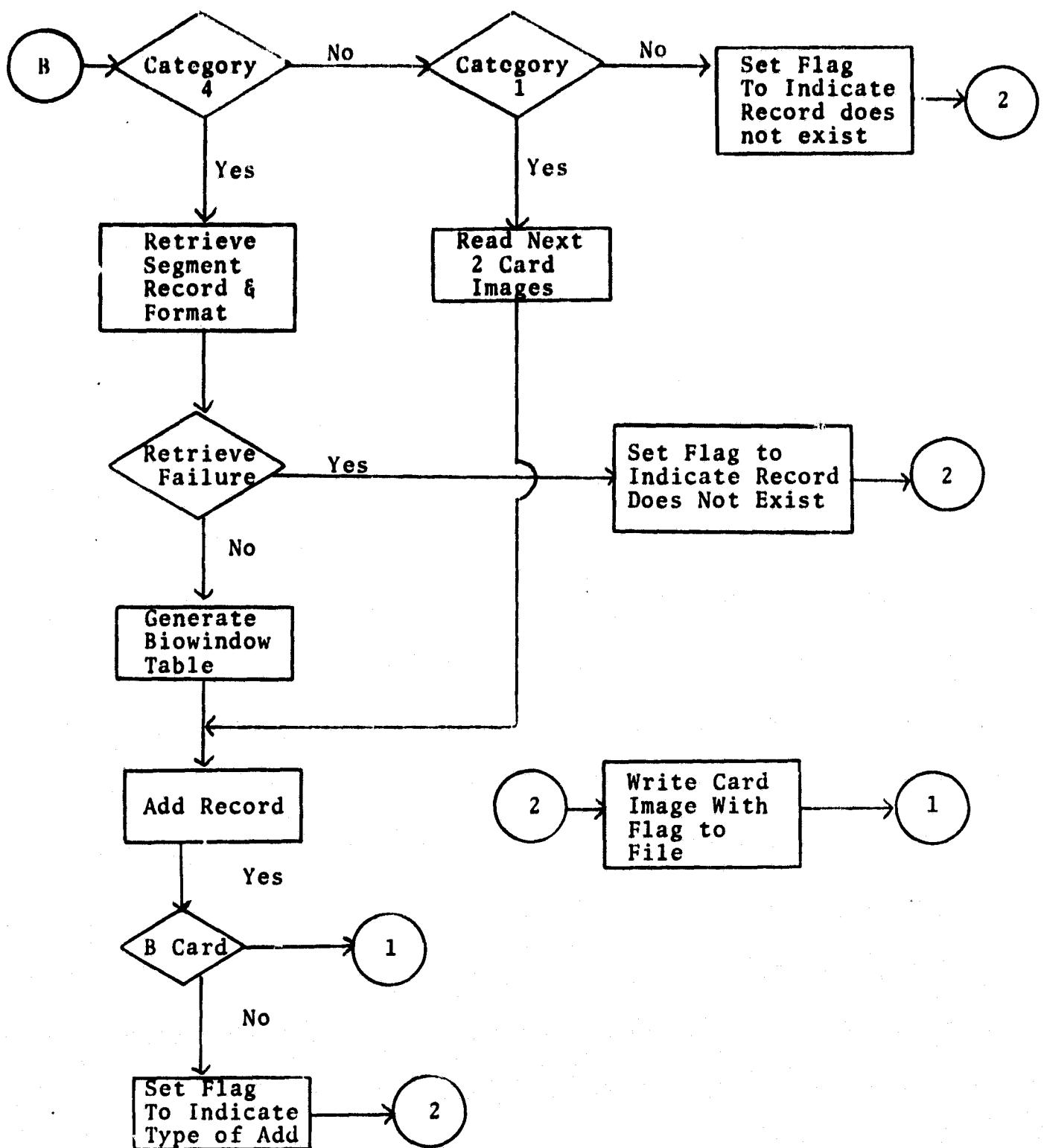


Special Update Processor Flow  
Figure 3-7



Special Update Processor Flow  
(Continued)

Figure 3-7



Special Update Processor Flow  
(Continued)

Figure 3-7

**TABLE 3-3.- INPUT TRANSLATION TABLE FOR GENERATING SEGMENT  
STATUS CHARACTER**

Existing value	Card type 4	Card type 5	Card type 6
0	1	2	4
1	1	3	5
2	3	2	6
3	3	3	7
4	5	6	4
5	5	7	5
6	7	6	6
7	7	7	7

TABLE 3-4. -SPECIAL UPDATE DESCRIPTION

Category	Method of Identifying Record	Action on Retrieval Failure	Generate Biowindow Table	Type of Operation	Additional Processing
1	SEG #	Success: Update (1b) Fail: Add		Add	
1b				Update	
2	SEG #	Fail: Generate Error	Yes	Update	Set Bio- window Field in Acq. Records
3	SEG #	Fail: Generate Error		Update	
4	SEG # & Acq. Date	Fail: 4B Success: Update		Update	
4b	SEG #	Fail: Generate Error	Yes	Add (Acq. Record)	
5	SEG # & Acq. Date	Fail: Generate Error		Update Update	

The input processing for all fields of each card type is defined in the ASATS requirements documents, except for Segment Status Character in DAPTS records and Acquisition Status character in FLOCON records. Table 3-3 will be used to set the segment status character. The Acquisition Status Character is set to the card type. These fields are used for generating the current station and status. Their use is described in Section 3.6.

The type of operation, an add or a modify, to be performed is a function of record type and whether or not a record already exists. The input format for the card type identifies the fields it updates and the field's data type. Table 3-5 describes the processing for field types on input.

TABLE 3-5.-USE OF DATA TYPES ON INPUT

<u>Data Type</u>	<u>Processing</u>
0	Alpha - update associated data base field as alpha
1	Integer - update associated data base field as integer (standard RIMS data type, but not used for ASATS)
2	Set data base field from table according to card type
3	Set data base field value from status table according to card type and existing value
4	Alpha but don't update data base when input blank
5	Record I.D. field (no action)
6	Increment data base field value by 1 on input (Integer field)
7	Reject input if associated data base field is blank
8	Set data base value as a function of biowindow table and acquisition date
9	Set data base field value from comment table according to card type

If an error condition occurs when processing an input card, an error type is put in column 80 when the image is written to the message file. The input card images for new DAPTS records are also written to the message file; column 80 is blank for them.

Additional processing required by category 3 is the selection of FLOCON records of the same segment and the updating of their biowindow fields.

### **3.3.1.2 Use of Input Formats**

An input format is required to describe certain processing associated with each record type. This description includes:

- Identification of each field affecting the update process
- Type identification of each field, which defines how the field affects the update process (see section 3.3.1.1).

- Starting location and length of each field of information on the data card (it should be noted that some fields affect the processing, but do not exist on the data card, therefore do not have a starting location and length).

The field names used must correspond to the field names used in the data base definition (see section 3.2). Field location and field use on input cards are described in the ASATS requirements documents.

Implementation using input format definitions allows for simple accommodation of most types of changes in input requirements. The addition of a new card type would require a modification of tables within the special update command processor. B and 3 type input cards do have codes which are unique to them.

### 3.3.2 SPECIAL COMMANDS FOR ANNOTATING REPORTS

A new command (header) allows the user to include text which is not a part of the data base and to include printer carriage controls. Another new command is included which allows the user to print a set count with text which he specifies.

#### 3.3.2.1 Header Command

Purpose: To insert header or comment on report

Input: HD N, Text

where: HD is command name

N is the number of input lines (1 or 2)

Text is the header contents

Output: N lines of text

Processing: Text is transferred from command file to report file with the first character being used for carriage control. Standard FORTRAN convention used for carriage control (for example, see next page).

### **3.3.2.2 Count Command**

**Purpose:** to print number of entries in a set with text comment.

**Input:** HC SN, LOC, Text

**where:**

HC is the command

SN is set number that count for which is printed

LOC is column count where count is to be printed

Text is the text data to be printed

**Processing:** Text is transferred from command file to report file and number of entries is printed with it. The first text character is used for carriage control.

### **3.3.3 SOFTWARE TO ELIMINATE REDUNDANT STORAGE**

The following new RIMS commands were designed in order that certain data does not have to be stored redundantly in different FLOCON records. The DAPTS and FLOCON records of the ASATS data base will have a hierarchical relationship. The DAPTS record (the parent record) contains information common to several FLOCON records.

#### **3.3.3.1 Generate Parent Set**

**Purpose:** To generate a set of parent records (DAPTS records, for ASATS) from a given set (FLOCON records, for ASATS)

**Input:** GPSN

**where:** GP is command

SN is a set number

**Output:** a set (next available set number) of parent records

**Processing:** The parent record ID for each record ID in the input set is placed in the output set.

#### **3.3.3.2 Generate Children Set**

**Purpose:** to generate a children set (FLOCON records in ASATS) for a set of parent records (DAPTS record in ASATS).

**Input: GC SN**

where: GC is the command  
SN is the parent set

**Output: Parent set (whose set number is the next available set number)**

**Processing:** The record pointer address is computed for each record ID in the parent set. The addresses for potential children records (16 following parent records) is searched to determine if children records exist. Each child ID that is found is then transferred to the children set.

### **3.3.3.3 Display Data from Two Data Base Levels**

**Purpose:** To display a set of FLOCON records with information from the associated DAPTS records, as specified by a format.

**Input DA SN, FN**

where: DA is command  
SN is set number for a set of FLOCON records  
FN is format ID for displaying data

**Output:** specified set in specified format on report file.

**Processing:** The format for displaying data is retrieved. Then for each record ID in the input set the following actions are taken:

- Get record ID from set
- Retrieve record and associated format
- Transfer data from the FLOCON record to an output buffer according to the display format
- Generate record ID for associated DAPTS record
- Retrieve DAPTS record and associated format
- Transfer data from the DAPTS record to output buffer according to the display format
- Write output buffer to identified file

### 3.3.4 ACCESS CONTROL

The following new commands, software, and RIMS mods are defined to satisfy access control requirements. Each user will have an access control word. It will control what RIMS commands he can use.

#### 3.3.4.1 Add Access Control Word

Purpose: to add access control word for the data base

Input: AC CW, BIT STRING

where: AC is the command

CW is an 8 character access control word

BIT STRING is a 24 character string identifying which commands the user having this access code can utilize

Output: Access code and character string are stored in data base

Processing: A record is generated containing the character string. A key is generated by concatenating @ with the character string. The record is posted to that key. Note: a key with @ in the first position will not be displayed by the expand function.

#### 3.3.4.2 Delete Access Control Word

Purpose: to delete an access control word.

Input: DC CW

where: DC is the command

CW is the access control word

Output: None

Processing: The record posted to the word CW is deleted and the key associated with the control word is deleted.

#### 3.3.4.3 Modifications to "Begin" Operation for Access Control

Purpose: to allow identification of a user to RIMS by access control word

Input changes: BE DBN, CW

where CW is a control word

**Output changes:** None

**Processing changes:** the record associated with the control word is retrieved. If a particular control word does not exist, RIMS is aborted.

#### **3.3.4.4 Modification to RIMS Control Routine for Access Control**

**Purpose:** to prevent execution of unauthorized commands

**Output:** Message to message file - 'Unauthorized command'

**Processing:** Before calling subroutine to process the associated command the character string containing indicators of user's authorized commands is examined. If user is not authorized for the command, the message is output and the subroutine is not executed.

#### **3.3.5 ARITHMETIC OPERATIONS**

A new RIMS command has been included to provide the typical statistical and arithmetic type operations required by ASATS in the ad hoc environment.

##### **3.3.5.1 Compute Command**

**Purpose:** to provide for a set of records (1) summation of identified field, (2) mean of the difference of two fields, (3) standard deviation of the differences of two fields.

**Input:** AR SN, RID, F1, F2

where: AR is the command

SN is the set number for which all computations are to be performed

RID is the record ID for the record where the results of the computation are to be stored

F1 is a field name

F2 is a field name

**Output:** Sums of both fields, mean of difference, standard deviation of difference, count of number of records used in mean computation, and the count of the total number of records are stored in the specified record.

**Processing:** Each record in a set is retrieved and processed.

The following computation is performed for each record.

- Each field is summed over all records in which both fields are not blank.
- A count of the number of records is maintained.
- For each record where neither field is blank
  - Count of the records is maintained
  - Sum of the difference of the two fields is maintained

After all records have been processed, the mean and the standard deviation of the differences are computed. All computations are then stored in the specified record.

### 3.3.6 MODIFICATION TO EXISTING COMMANDS

In order to implement standard reports by executing a RIMS command file containing the RIMS commands for reports, two capabilities are needed. They are:

- The ability to generate null sets
- The ability to assign a file by name

The following will provide these capabilities.

#### 3.3.6.1 Modification to Reassign File

**Input modifications:** The current syntax is

RF IU, EU

where: RF is the command

IU is the internal unit number

EU is the external unit number

the syntax will be modified to be:

RF IU, EU, File Name

so that if IU is 0 (zero) then EU is set to the included file name.

**Output modifications:** None

**Processing modification:** If the internal unit is zero, the external unit is closed then opened with the specified file name. Otherwise processing is the same.

#### 3.3.6.2 Null Set Option

**Input:** ZS OP

where ZS is command

OP is the option: 1 for null sets to be kept; zero for null sets not kept. At sign-on, the default mode of the system will be for null sets not kept.

**Output:** None

**Processing:** A flag is set in a common block to indicate mode.

### 3.3.6.3 Changes to Other Routines for Null Sets

Minor changes to the select, combine, specify and select non-key functions will have to be made to allow generation of null sets.

### **3.4 THE PREPROCESSOR**

#### **3.4.1 PURPOSE**

The Preprocessor produces several of the required audit report listings of the input update cards, and acts as an interface between the unsorted, unedited input form and the form of input required for the RIMS data management software.

#### **3.4.2 INPUT**

The Preprocessor accepts update cards of all types as described in the ASATS Specifications Document LEC-8675. The cards may be in any order and must include one and only one Q card.

The input cards for the Preprocessor must be surrounded by a proper set of batch control cards for the PDP 11/45 RSX-11D operating system. The proper sequence of control cards will be specified in the Operations Manual to be provided as part of this project.

#### **3.4.3 OUTPUT**

The output of the Preprocessor will be of two kinds. The first kind is the listings of input cards:

- A listing of all cards in the order of their input
- A listing of all cards having invalid card types
- A listing of all cards rejected as duplicates
- A listing of all cards submitted for this update run, sorted into order by card type.

The second kind of output from the Preprocessor is a set of files of update card images which will serve as input to the RIMS system for actual update of the data base. These files are:

- A file of all sets of \*, 2, 3 cards, where a complete set is given for any segment
- A file of \*, 2, 3 cards in which only one or two of the cards appears for any segment

- A file of other update cards sorted into the order:  
Q, 4, 5, 6, B, 7, 8, 9, G, H, I, J, K, M, X, U.

#### 3.4.4 DESCRIPTION OF PROCESS

The Preprocessor will consist of a sequence of operations performed by special-purpose FORTRAN programs and by calls to the RSX-11D system SORT utility program. Data flow for this sequence of operations is shown in figure 3-8.

The first operation shown gives two of the output listings and separates the LACIE phases into separate files. The remainder of the data flow is shown for only one LACIE phase, the flow for the other phase being separate but of the same form.

The second operation is performed by the RSX-11D system SORT utility, to put the cards into order by card type.

The next operation shown is a separation of cards by type. The type \*, 2, 3 cards will be sorted by segment number to find those segments for which all three are present and which may, therefore, be new segments for entry among the DAPTS records. Cards not part of a set will be sorted back into card type order with \* cards first, then 2 cards, then the 3 cards. Cards of other types (4, 5, 6, B, 7, . . .) are put into another separate file.

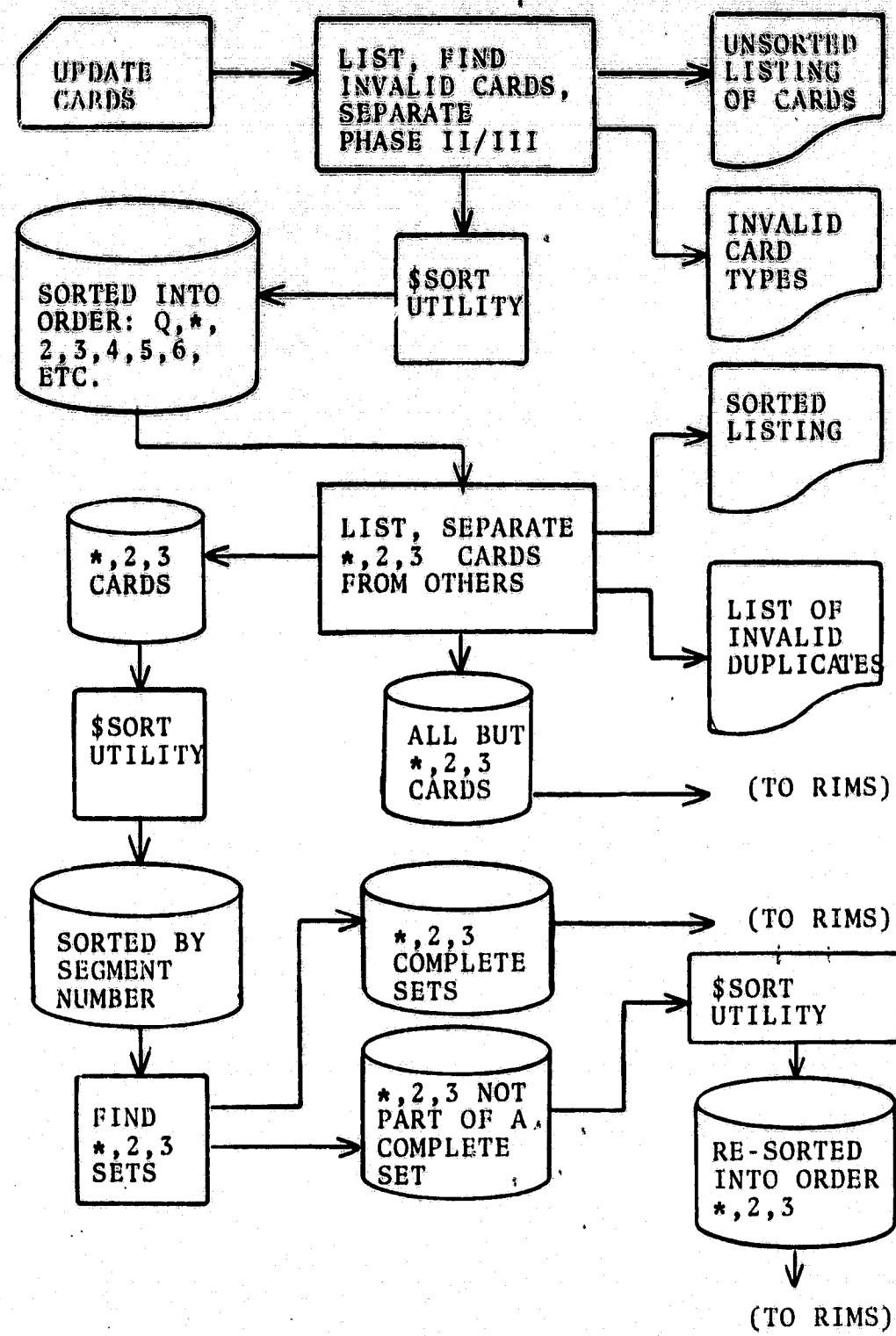


FIGURE 3-8  
THE PREPROCESSOR

### 3.5 THE POSTPROCESSOR

#### 3.5.1 PURPOSE

The Postprocessor is required because core space limitations impose a limit on the number of output files that can be defined in RIMS. RIMS will write several logical output files into one actual output file and attach a flag to each record to allow the Postprocessor to separate the output files.

#### 3.5.2 INPUT

Input to the Postprocessor is a file of information about updates made or attempted by RIMS.

#### 3.5.3 OUTPUT

Output from the Postprocessor consists of one file of card images to be punched and several files of report listings, as follows:

- Cards punched (4, 5, 6 cards for each \*, 2, 3 set that created a new DAPTS segment record, and G, H cards punched for each B card that created a new FLOCON acquisition record)
- A listing of the cards punched
- A listing of all new DAPTS segment records added
- A listing of invalid acquisitions (B cards for which no DAPTS record has the same segment number)
- A listing of invalid attempts to modify a DAPTS record (modifications from \*, 2, 3, 4, 5, 6 cards such that no existing DAPTS record has the given segment number)
- A listing of invalid modifications to FLOCON records (no matching segment number and/or acquisition date for input G, H, I, J, K, M, U, X, 7, 8, or 9 cards) or a required data base field has never been set (as required for card types H, I, J, etc.).

### 3.5.4 PROCESS

The Postprocessor will read the output file from RIMS and write into the proper output file(s) chosen on the basis of a flag included with each record from RIMS. See Figure 3-9.

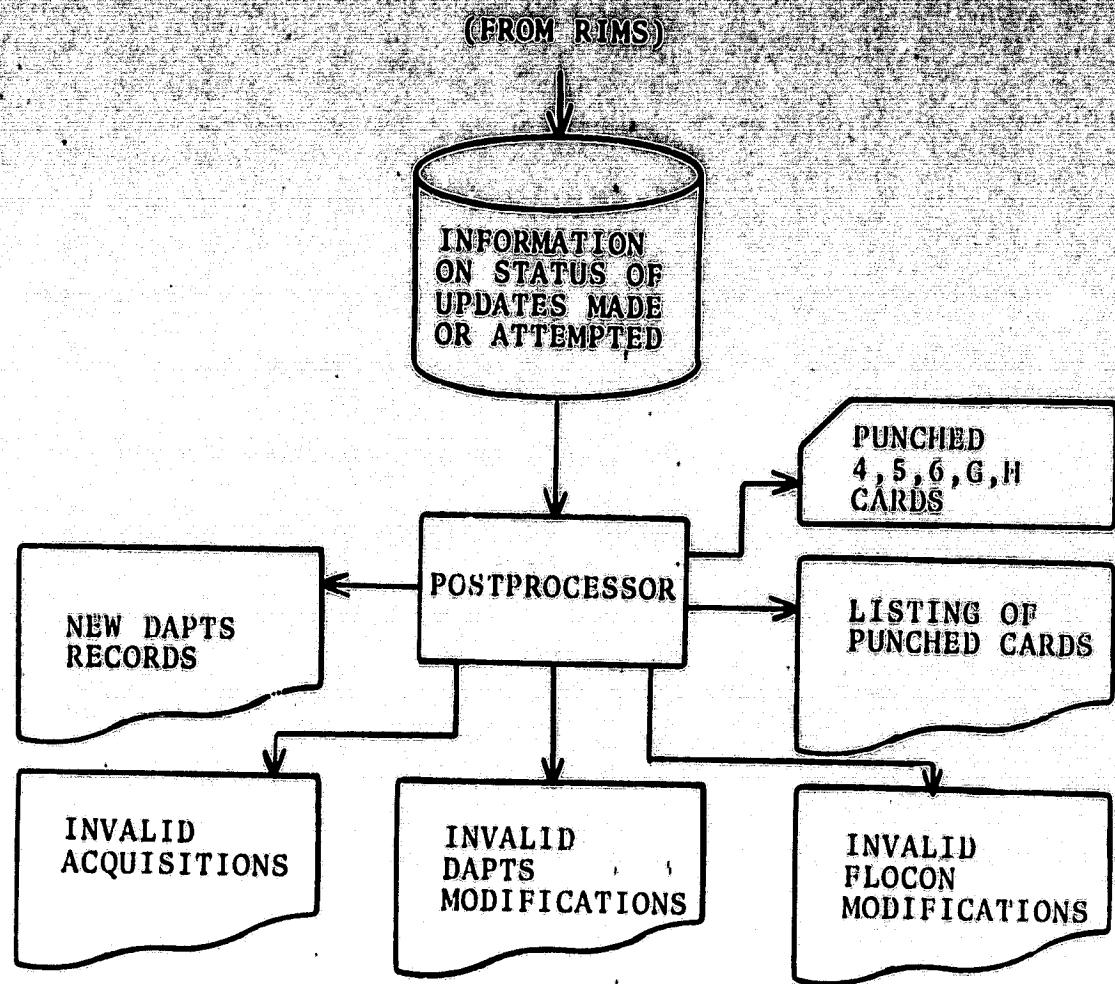


FIGURE 3-9  
ASATS - THE POSTPROCESSOR

### **3.6 ASATS STANDARD REPORTS**

All standard reports identified, as required for ASATS, can be produced using the RIMS commands (as augmented in section 3.4 of this document) and the added output translation function. Once a data base has been established as described in this document, RIMS provides the functional capabilities required for these reports.

In order to satisfy the standard report and ad hoc report requirements using the data base design as described in section 3.2, it is necessary to perform output translation for some parameters. Two methods of output translation are required. The first method would generate the output field value as a function of the input field value using a predefined table. The second method is identical except that the output translation occurs only if the output field contains a blank value (thus providing an override capability).

Four tables are required for the necessary output translations. They are:

- Current location table as a function of Acquisition Status Character
- Current status table as a function of Acquisition Status Character
- Current comment table as a function of Acquisition Status Character
- Table indicating crop calendar, ancillary data and topographic data status as a function of segment, status character.

The contents of the first three tables are illustrated in Table 1 of reference 1. The fourth table is functionally

described in section 3.2.4 of reference 1.

Two additional data types are required for output processing. They are:

- Type 6 - Perform output translation using current location table.
- Type 7 - Perform output translation using current status table.

For each data type, the input format specifies the location of data to be used for the table look-up. The output format specifies the location where the table results are to be placed in the output record.

The approach for implementing these reports is to build separate files containing the necessary RIMS commands for each report. The report can then be produced by assigning the file as a RIMS command file. Batch decks will also be provided which will cause execution of these reports.

The requirements for each report can be translated directly into RIMS commands. Therefore a discussion of individual reports is not included in this document.

#### 4. TEST PLAN

Three levels of testing will be performed for RIMS software. The three levels are component, subsystem, and system where components are one or more subroutines working together. The Update Preprocessor, Update Postprocessor, RIMS, and ASATS reporting operations may be viewed as separate subsystems.

Component level testing will be performed in an informal environment. Test procedures and results will not be documented.

A formal acceptance test will be prepared and executed for RIMS, an ASATS subsystem. Demonstrations and test results will be made available to illustrate successful testing of other ASATS subsystems. Acceptance test procedures will be documented for ASATS. A preliminary version of these procedures will be executed with a system level test to illustrate system readiness for a parallel running of both the PDP 11/45 and COMSHARE version of RIMS. The ASATS data base on COMSHARE will be moved to this system. Both the PDP 11/45 and COMSHARE ASATS will process all updates and reports for two weeks. Upon successful completion of the parallel runs (both systems produce functionally identical results), the formal acceptance test with finalized procedures will be executed.

## 5. TRAINING PLANS

Documentation will be provided to support the PDP 11/45 version of ASATS. Documents to be provided are:

- Operations Document - it will contain the necessary instructions for the computer operator to (1) run the batch update programs, (2) run standard batch reports, (3) run the data base reorganization program, and (4) recover the ASATS data base.
- ASATS Users Document - it will contain (1) procedures for setting up an ASATS batch update deck, (2) guidelines on when to reorganize a data base, (3) procedures for creating a new data base.
- Update RIMS USER Document - this document currently describes each RIMS command. A description of all new RIMS commands will be included.
- User Training Course - a training course in the use of RIMS and ASATS will be provided.